

Frame S' moves at v relative to the inertial frame S along the x-direction, as shown in the figure. O and O' coincide at t = t' = 0. According to the principle of relativity the transformation between S and S' obeys

$$\begin{cases} x' = A(x - vt) \\ x = A(x' + vt') \\ y = y', z = z' \end{cases}$$

(a) Solve for t' and express it in terms of t and x.

A light flashes at the origin at t = 0 and propagates as a spherical wave. The wave front described by observers in S and S' is, respectively,

$$\begin{cases} (ct)^2 - x^2 - y^2 - z^2 = 0 & \text{in } S\\ (ct')^2 - x'^2 - y'^2 - z'^2 = 0 & \text{in } S' \end{cases}$$

(b) Find A.